# Switching Edexcel GCSE (9-1) Biology to OCR GCSE (9-1) Twenty First Century Biology B

## Introduction

Are you currently teaching the Edexcel GCSE sciences? Are you thinking of switching? We are here to help.

We will provide you with all the support you could need to switch from the Edexcel GCSE Biology qualification to our OCR GCSE Biology B, including:

* Mapping of Edexcel’s specification to OCR’s specification
* An overview of the differences in assessment
* Mapping of the Edexcel textbook to OCR’s specification

## Our offer

* Our GCSE (9-1) Twenty First Century Biology B qualification has been developed in partnership with University of York Science Education Group (UYSEG) and working with a number of stakeholders, including OCR Science Consultative Forum, teachers and assessors. It has been created to be a qualification which engages students so they achieve their full potential.
* Our GCSE team are passionate about both science and education. With industry, teaching and assessment experience, they are fully committed to supporting centres’ delivery of our GCSE qualifications.
* We have produced a wide range of support materials, such as handbooks (including maths skills), delivery guides, practical activities and end of chapter quizzes. We have a selection of practice papers which can be used as mock papers in preparation for the exams and we have a free and user-friendly tool - ExamBuilder - that you can use to create customised papers for students.
* Within this document as well as mapping the specifications, we also provide textbook mapping – illustrating how you can use your existing Edexcel Pearson textbooks to teach the OCR specification; making it easier for you to use the resources you already have.
* Join our conversations on the OCR Community and @ocr\_science on Twitter to discuss and share good practice.

## Key differences

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| **OCR GCSE (9-1) Twenty First Century Biology B** | **Edexcel GCSE (9-1) Biology** |
| **8 flexible practical** activities -select from our suggested activities or use your own preferred practical activities. | 8 core practical activities you have to deliver. |
| In each assessment students have 1 hour and 45 minutes to complete **90** marks worth of questions  | In each assessment learners have 1 hour and 45 minutes to complete **100** marks worth of questions. |
| Context – linked specification | Content led specification. |
|  **Two** 6 mark level of response in the depth paper and **none** in the breadth  | **Two** 6 mark level of response question on all sample assessment material. |

## Content mapping

The content within the OCR GCSE (9-1) in Biology B (Twenty First Century) covers the key concepts of biology and will be very familiar. We’ve laid it out in a logical progression to support teaching the GCSE in a linear way.

Below is a table to show where Edexcel biology content is covered in the OCR Twenty First Century biology specification.

| **Pearson Edexcel Level 1/Level 2 GCSE (9-1) in Biology (1BIO)** | **OCR Biology B (Twenty First Century Science) (J259)** | **Surplus Content In Pearson Edexcel Biology** |
| --- | --- | --- |
| Topic 1 Key concepts in biology | 4.3 how do organisms grow & develop4.2 how do we know about mitochondria & other cell structures3.1 what happens during photosynthesis4.1 what happens during cellular respiration3.2 how do producers get the substances they need5.1 how do substances get into, out of and around our bodies |  |
| Topic 2 Cells and control | 4.3 how do organisms grow & develop4.5 should we use stem cells to treat damage and disease5.2 how does the nervous system help us to respond to changes5.6 what can happen when organs and control systems stop working | 2.7 demonstrate an understanding of the use of percentiles charts to monitor growth |
| Topic 3 Genetics | 6.2 how do sexual and asexual reproduction affect evolution (separate science only)4.3 wow do organisms grow & develop1.1 what is the genome & what does it do1.2 how is genetic information inherited6.1 how was the theory of evolution developed | 3.17B describe the inheritance of the ABO blood groups with reference to co-dominance and multiple alleles3.18B Explain how sex linked genetic disorders are inherited (higher tier only) |
| Topic 4 Natural selection & genetic modification | 6.1 how was the theory of evolution developed6.3 how does our understanding of biology help us classify the diversity of organisms on earth1.3 how can and should gene technology be used6.4 how is biodiversity threatened & how can we protect it | 4.5 Describe the evidence for human evolution based on stone tools including the development of tools over time, how these tools can be dated from their environment4.9B describe the process of tissue culture and its advantages in medical research and plant breeding programmes |
| Topic 5 Health, disease & the development of medicines | 2.1 what are the causes of disease2.5 how can lifestyle genes and the environment affect my health2.3 how can we prevent the spread of infection2.2 how do organisms protect themselves against pathogens2.4 how can we identify the cause of an infection (separate science only)2.6 how can we treat disease | 5.7B describe the lifecycle of a virus including lysogenic and lytic pathways |
| Topic 6 Plant structures & their functions | 3.3 how are organisms in an ecosystem interdependent3.1 what happens during photosynthesis3.2 how do producers get the substances they need4.4 how is plant growth controlled (separate science only) | 6.14B explain how plants are adapted to survive in extreme environments including the effect of leaf size and shape the cuticle and stomata |
| Topic 7 Animal coordination, control and homeostasis | 5.3 how do hormones control responses in the human body5.5 what role do hormones play in human reproduction5.4 why do we need to maintain a constant internal environment5.6 what can happen when organs and control systems stop working | 7.17 evaluate the correlation between body mass and type 2 diabetes including waist: hip calculations and BMI using the BMI equation: BMI = weight/height2 |
| Topic 8 Exchange & transport in animals | 5.1 how do substances get into, out of and around our bodies4.1 what happens during cellular respiration | 8.5B calculate the rate of diffusion using Fick’s law: rate of diffusion = (surface area x concentration difference)/thickness of membrane8.12 calculate heart rate stroke volume and cardiac output using the equation: cardiac output = stroke volume x heart rate |
| Topic 9 Ecosystems & material cycles | 3.3 how are organisms in an ecosystem interdependent3.4 how are populations affected by conditions in an ecosystem6.4 how is biodiversity threatened and how can we protect it |  |

## Assessment

A comparison of the differences in assessment models is below:

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| --- | --- |
| **OCR GCSE (9-1) Twenty First Century Biology B** | **Edexcel GCSE (9-1) Biology** |
| **Paper 1** **(Breadth)**Assessed: All ChaptersTime allowed: 1 hour 45 minutesFoundation and Higher tier availableMarks: 90 marksWeighting: 50% of GCSEQuestion types: Short answer (maximum 4 marks per question), some multiple choice and objective style questions | **Paper 1** Assessed: Topics 1-5Time allowed: 1 hour 45 minutesFoundation and Higher tier availableMarks: 100 marksWeighting: 50% of GCSEQuestion types: Multiple choice, structured, closed short answer and open response  |
| **Paper 2** **(Depth)**Assessed: All chaptersFoundation and Higher tier availableMarks: 90 marksWeighting: 50% of GCSEQuestion types: Multiple choice, structured, closed short answer and open response, 2 x 6 mark level of response questions | **Paper 2** Assessed: Topics 1, 6-9 Time allowed: 1 hour 45 minutesFoundation and Higher tier availableMarks: 100 marksWeighting: 50% of GCSEQuestion types: Multiple choice, structured, closed short answer and open response |

## Using the Edexcel textbook

Below you will find all the information you need to start teaching OCR GCSE (9-1) Twenty First Century Biology B while still using the new Edexcel textbooks. We have mapped our specification to the Edexcel Pearson textbook to save you the having to buy another set of textbooks. We also have endorsed textbooks for use with our specification and details of these textbooks can be found on the qualification page on the OCR website.

| **Specification statement** | **Chapter covering specification statement** | **Page number** | **Comments** |
| --- | --- | --- | --- |
| **Chapter B1 You and your genes** |
| **B1.1 What is the genome and what does it do?** |
| B1.1.1 a) explain how the nucleus and genetic material of eukaryotic cells (plants and animals) and the genetic material, including plasmids, of prokaryotic cells are related to cell functionsb) describe how to use a light microscope to observe a variety of plant and animal cells PAG1 | SB1a plant and animal cells, Sb1b core practical | 2 & 3, 6 &7 | SB1b core practical using microscopes |
| B1.1.2 describe the genome as the entire genetic material of an organism | SB3b meiosis | 52 |  |
| B1.1.3 describe DNA as a polymer made up of nucleotides, forming two strands in a double helix | SB3ci DNA | 54 |  |
| B1.1.4 describe simply how the genome and its interaction with the environment influence the development of the phenotype of an organism, including the idea that most characteristics depend on instructions in the genome and are modified by interaction of the organism with its environment *i Learners are not expected to describe epigenetic effects* | SB3b meiosis SB3k variation | 52, 72 |  |
| B1.1.5 explain the terms chromosome, gene, allele, variant, genotype and phenotype | SB3b meiosis SB3g alleles | 52, 64, 65 | Gamete, chromosome, gene, allele, dominant, recessive, homozygous, heterozygous, genotype, phenotype |
| B1.1.6 explain the importance of amino acids in the synthesis of proteins, including the genome as instructions for the polymerisation of amino acids to make proteins | SB3d protein synthesis | 58 & 59 | transcription on p58, translation p59 with diagrams, but not very simple |
| B1.1.7 describe DNA as a polymer made from four different nucleotides, each nucleotide consisting of a common sugar and phosphate group with one of four different bases attached to the sugar (separate science only) | SB3ci DNA | 54 |  |
| **B1.1.8 explain simply how the sequence of bases in DNA codes for the proteins made in protein synthesis, including the idea that each set of three nucleotides is the code for an amino acid (separate science only)** | SB3e genetic variants and phenotypes  | 60 |  |
| **B1.1.9 recall a simple description of protein synthesis, in which:• a copy of a gene is made from messenger RNA (mRNA)• the mRNA travels to a ribosome in the cytoplasm• the ribosome joins amino acids together in an order determined by the mRNA*****i Learners are not expected to recall details of transcriptionand translation* (separate science only)** | SB3d protein synthesis | 58 & 59 | transcription on p58, translation p59 with diagrams, but not very simple |
| **B1.1.10 recall that all genetic variants arise from mutations (separate science only)** | SB3e genetic variants and phenotypes SB3j gene mutation | 60, 61, 70 | eye colour, weight and height not given as examples |
| **B1.1.11 describe how genetic variants in coding DNA may influence phenotype by altering the activity of a protein (separate science only)** | SB3d protein synthesis SB3e genetic variants an phenotypes | 59, 60, 61 |  |
| **B1.1.12 describe how genetic variants in non-coding DNA may influence phenotype by altering how genes are expressed (separate science only)** | SB3d protein synthesis SB3e genetic variants an phenotypes | 59, 60, 61 |  |
| **B1.2 How is genetic information inherited?** |
| B1.2.1 explain the terms gamete, homozygous, heterozygous, dominant and recessive  | SB3b meiosis SB3g alleles | 52, 64, 65 | Gamete, chromosome, gene allele, dominant, recessive, homozygous, heterozygous genotype, phenotype |
| B1.2.2 explain single gene inheritance, including dominant and recessive alleles and use of genetic diagrams | SB3h inheritance | 66, 67 |  |
| B1.2.3 predict the results of single gene crosses  | SB3h inheritance | 66, 67 |  |
| B1.2.4 use direct proportions and simple ratios in genetic crosses | SB3h inheritance | 66 |  |
| B1.2.5 use the concept of probability in predicting the outcome of genetic crosses | SB3h inheritance | 66 | worked example |
| B1.2.6 recall that most phenotypic features are the result of multiple genes rather than single gene inheritance  *i Learners are not expected to describe epistasis and its effects* | SB3i multiple and missing alleles | 68, 69 |  |
| B1.2.7 describe the development of our understanding of genetics including the work of Mendel **and the modern-day use of genome sequencing** (separate science only) | SB3f Mendel SB3j gene mutation | 62, 63, 71 |  |
| B1.2.8 describe sex determination in humans  | SB3h inheritance | 66 |  |
| **B1.3 How can and should gene technology be used?** |
| B1.3.1 discuss the potential importance for medicine of our increasing understanding of the human genome, including the discovery of alleles associated with diseases and the genetic testing of individuals to inform family planning and healthcare | SB3j gene mutation | 71 | Human genome project |
| B1.3.2 describe genetic engineering as a process which involves modifying the genome of an organism to introduce desirable characteristics | SB4e breeds and varieties SB4g genes in agriculture and medicine | 85, 89 | (p89 bacterial modification) |
| **B1.3.3 describe the main steps in the process of genetic engineering including:• isolating and replicating the required gene(s)• putting the gene(s) into a vector (e.g. a plasmid)• using the vector to insert the gene(s) into cells• selecting modified cells** | SB4g genes in agriculture and medicine | 89 | (no mention of selection using antibiotic resistance markers) |
| B1.3.4 explain some of the possible benefits and risks,including practical and ethical considerations, of using gene technology in modern agriculture and medicine | SB4g genes in agriculture and medicine SB4h GM and agriculture | 88, 89, 90, 91 |  |
| **Chapter B2 Keeping healthy** |
| **B2.1 What are the causes of disease?** |
| B2.1.1 describe the relationship between health and disease  | SB5a health & disease | 96, 97 |  |
| B2.1.2 describe different types of diseases (including communicable and non-communicable diseases)  | SB5a health & disease | 97 |  |
| B2.1.3 explain how communicable diseases (caused by viruses, bacteria, protists and fungi) are spread in animals and plants  | SB5e spreading pathogens SB5h plant diseases | 104, 105, 110, 111 | no numbers |
| B2.1.4 describe common human infections including influenza (viral), salmonella (bacterial), athlete’s foot (fungal) and malaria (protist) and sexually transmitted infections in humans including HIV/AIDS (viral) | Sb5d pathogens SB5h plant diseases SB5i physical & chemical barriers | 102, 110, 111, 113 |  |
| B2.1.5 describe plant diseases including tobacco mosaic virus (viral), ash dieback (fungal) and crown gall disease (bacterial) | Sb5d pathogens SB5h plant diseases SB5i physical & chemical barriers | 102, 110, 111, 113 |  |
| **B2.2 How do organisms protect themselves against pathogens?** |
| B2.2.1 describe non-specific defence systems of the human body against pathogens, including examples of physical, chemical and microbial defences | Sb5e spreading pathogens SB5g plant defences | 104, 105, 108, 109 |  |
| B2.2.2 explain how platelets are adapted to their function in the blood | SB8c the circulatory system  | 167 |  |
| B2.2.3 describe physical plant defences, including leaf cuticle and cell wall (separate science only) | SB5g plant defences | 108 |  |
| B2.2.4 explain the role of the immune system of the human body in defence against disease | SB5j the immune system | 114, 115 |  |
| B2.2.5 explain how white blood cells are adapted to their functions in the blood, including what they do and how it helps protect against disease | SB8c the circulatory system  | 167 |  |
| B2.2.6 describe chemical plant defence responses, including antimicrobial substances (separate science only) | SB5g plant defences | 108, 109 |  |
| **B2.3 How can we prevent the spread of infection?** |
| B2.3.1 explain how the spread of communicable diseases may be reduced or prevented in animals and plants, to include a minimum of one common human infection, one plant disease and sexually transmitted infections in humans including HIV/AIDS  | Sb5e spreading pathogens SB5g plant defences Sb5d pathogens SB5h plant diseases SB5i physical & chemical barriers | 104, 105, 108, 109, 102, 110, 111, 113 |  |
| B2.3.2 explain the use of vaccines in the prevention of disease, including the use of safe forms of pathogens and the need to vaccinate a large proportion of the population  | SB5j the immune system SB5k antibiotic and core practicals | 115, 116, 117, 118 | no mention of antivirals. (Antiseptics mentioned in core practical) |
| **B2.4 How can we identify the cause of an infection? (separate science only)** |
| B2.4.1 a) describe ways in which diseases, including plant diseases, can be detected and identified, in the lab and in the fieldb) describe how to use a light microscope to observe microorganisms PAG1 | SB5h plant diseases | 110, 111 |  |
| B2.4.2 describe and explain the aseptic techniques used in culturing organisms PAG7 | SB5k core practical antibiotics | 118, 119 |  |
| B2.4.3 calculate cross-sectional areas of bacterial cultures and of clear zones around antibiotic discs on agar jelly using πr2 PAG7 | SB5f virus life cycles | 107 |  |
| **B2.4.4 describe how monoclonal antibodies are produced including the following steps:****• antigen injected into an animal• antibody-producing cells taken from animal• cells producing the correct antibody selected then cultured** | SB5l monoclonal antibodies | 120, 121 |  |
| **B2.4.5 describe some of the ways in which monoclonal antibodies can be used in diagnostic tests**  | SB5l monoclonal antibodies | 121 |  |
| **B2.5 How can lifestyle, genes and the environment affect health?** |
| B2.5.1 a) describe how the interaction of genetic and lifestyle factors can increase or decrease the risk of developing non-communicable human diseases, including cardiovascular diseases, many forms of cancer, some lung and liver diseases and diseases influenced by nutrition, including type 2 diabetesb) describe how to practically investigate the effect of exercise on pulse rate and recovery rate PAG6 | SB5b non-communicable diseases SB5c cardiovascular disease SB7f type 2 diabetes | 98, 99, 100, 101, 152, 153 |  |
| B2.5.2 use given data to explain the incidence of non-communicable diseases at local, national and global levels with reference to lifestyle factors, including exercise, diet, alcohol and smoking  | SB5b non-communicable diseases  | 99 |  |
| B2.5.3 in the context of data related to the causes, spread, effects and treatment of disease:a) translate information between graphical and numerical formsb) construct and interpret frequency tables and diagrams, bar charts and histogramsc) understand the principles of sampling as applied to scientific datad) use a scatter diagram to identify a correlation between two variables  | SB5b non communicable diseases SB5c cardiovascular disease SB5h plant diseases SB5a health & disease  | 99, 100, 111, 96, 97 |  |
| B2.5.4 describe interactions between different types of disease  | SB5d pathogens | 102, 103 | HIV and TB only |
| **B2.6 How can we treat disease?** |
| B2.6.1 explain the use of medicines, including antibiotics, in the treatment of disease  | SB5j the immune system SB5k antibiotic and core practicals | 115, 116, 117, 118 | no mention of antivirals. (Antiseptics mentioned in core practical) |
| B2.6.2 calculate cross-sectional areas of bacterial cultures and of clear zones around antibiotic discs on agar jelly using πr2 PAG7 | SB5f virus life cycles | 107 |  |
| B2.6.3 evaluate some different treatments for cardiovascular disease, including lifestyle changes, medicines and surgery  | SB5c cardiovascular disease | 101 |  |
| B2.6.4 describe the process of discovery and development of potential new medicines including preclinical and clinical testing  | SB5k antibiotics | 116, 117 |  |
| **B2.6.5 describe how monoclonal antibodies can be used totreat cancer including:• produce monoclonal antibodies specific to a cancer cell antigen• inject the antibodies into the blood• the antibodies bind to cancer cells, tagging them for attack by white blood cells• the antibodies can also be attached to a radioactive or toxic substance to deliver it to cancer cells (separate science only)** | SB5l monoclonal antibodies | 121 |  |
| **Chapter B3 Living together - food and ecosystems** |
| **B3.1 What happens during photosynthesis?** |
| B3.1.1 a) describe the process of photosynthesis, including the inputs and outputs of the two main stages and therequirement of light in the first stage, and describe photosynthesis as an endothermic processb) describe practical investigations into the requirements and products of photosynthesis PAG5 | SB6a photosynthesis SB6b core practical - light intensity and photosynthesis | 124, 128 | not stated that it is a two stage process |
| B3.1.2 explain how chloroplasts in plant cells are related to photosynthesis | SB6a photosynthesis | 124 | not stated that it is a two stage process |
| B3.1.3 a) explain the mechanism of enzyme action including the active site, enzyme specificity and factors affecting the rate of enzyme-catalysed reactions, including substrate concentration, temperature and pHb) describe practical investigations into the effect of substrate concentration, temperature and pH on the rate of enzyme controlled reactions PAG4 | SB1g enzyme action SB1h enzyme activity SB1h core practical pH and enzymes, SB1h enzyme activity | 18, 19, 20, 21, 22, 23, 20, 21 | p20-21 factors affecting enzyme action p20-21 graphic representations and analysis |
| B3.1.4 a) explain the effect of temperature, light intensity and carbon dioxide concentration on the rate of photosynthesisb) describe practical investigations into the effect of environmental factors on the rate of photosynthesis PAG5 | SB6b factors that affect photosynthesis and core practical as above | 126, & 127 and 128 |  |
| **B3.1.5 use the inverse square law to explain changes in the rate of photosynthesis with distance from a light source**  | SB6b factors that affect photosynthesis | 127 |  |
| **B3.1.6 explain the interaction of temperature, light intensity and carbon dioxide concentration in limiting the rate of photosynthesis, and use graphs depicting the effects**  | SB6b factors that affect photosynthesis | 127 |  |
| B3.1.7 in the context of the rate of photosynthesis:a) understand and use simple compound measures such as the rate of a reactionb) translate information between graphical and numerical formc) plot and draw appropriate graphs selecting appropriate scales for axesd) extract and interpret information from graphs, charts and tables | SB6b factors that affect photosynthesis SB6b core practical - light intensity and photosynthesis | 126, 127, 129 | rate means speed, inverse square law |
| **B3.2 How do producers get the substances they need?** |
| B3.2.1 describe some of the substances transported into and out of photosynthetic organisms in terms of the requirements of those organisms, including oxygen, carbon dioxide, water and mineral ions  | SB1i transporting substances, core practical: osmosis in potato slices | 24, 25 |  |
| B3.2.2 a) explain how substances are transported into and out of cells through diffusion, osmosis and active transportb) describe practical investigations into the processes of diffusion and osmosis PAG8*i Learners are not expected to explain osmosis in terms of water potential* | SB1i transporting substances, core practical: osmosis in potato slices | 24, 25 |  |
| B3.2.3 explain how the partially-permeable cell membranes of plant cells and prokaryotic cells are related to diffusion, osmosis and active transport | SB1i transporting substances, core practical: osmosis in potato slices | 24, 25 |  |
| B3.2.4 explain how water and mineral ions are taken up by plants, relating the structure of the root hair cells to their function  | SB6c absorbing water and mineral ions | 130, 131 |  |
| B3.2.5 a) explain how the structure of the xylem and phloem are adapted to their functions in the plantb) describe how to use a light microscope to observe the structure of the xylem and phloem PAG1 | SB6d transpiration & translocation | 133 | also diagram p134 |
| B3.2.6 a) describe the processes of transpiration and translocation, including the structure and function of the stomatab) describe how to use a light microscope to observe the structure of stomata PAG1c) describe how to use a simple potometer PAG6 *i Learners are not expected to describe transpiration in terms of tension or pressure, and are not expected to describe translocation in terms of water potential or hydrostatic pressure* | SB6d transpiration & translocation SB6a photosynthesis | 132, 133, 125 |  |
| B3.2.7 a) explain the effect of a variety of environmental factors on the rate of water uptake by a plant, to include light intensity, air movement, and temperatureb) describe practical investigations into the effect of environmental factors on the rate of water uptake by a plant PAG6 | SB6d transpiration & translocation | 132, 133 |  |
| B3.2.8 in the context of water uptake by plants:a) use simple compound measures such as rateb) carry out rate calculationsc) plot, draw and interpret appropriate graphsd) calculate percentage gain and loss of mass | SB6b factors that affect photosynthesis SB6b core practical - light intensity and photosynthesis SB2b growth in animals SB2c growth in plants | 126, 127, 129, 33, 35 | rate means speed, inverse square law |
| **B3.3 How are organisms in an ecosystem interdependent?** |
| B3.3.1 a) explain the importance of sugars, fatty acids and glycerol, and amino acids in the synthesis and breakdown ofcarbohydrates, lipids and proteinsb) describe the use of qualitative tests for biological molecules PAG2 | SB1e enzymes & nutrition | 12 |   |
| B3.3.2 describe photosynthetic organisms as the main producers of food and therefore biomass for life on Earth  | SB6a photosynthesis | 124 |  |
| B3.3.3 describe some of the substances transported into organisms in terms of the requirements of those organisms, including dissolved food molecules  | SB8a efficient transport and exchange | 162, 163 |  |
| B3.3.4 describe different levels of organisation in an ecosystem from individual organisms to the whole ecosystem  | SB9a ecosystems | 176, 177 |  |
| B3.3.5 explain the importance of interdependence and competition in a community  | SB9a ecosystems SB9d biotic factors and communities SB9f parasitism and mutualism | 176, 184, 185, 188, 189 | (definition of interdependence) |
| B3.3.6 describe the differences between the trophic levels of organisms within an ecosystem (separate science only) | SB9b energy transfer | 178 |  |
| B3.3.7 describe pyramids of biomass and explain, with examples, how biomass is lost between the different trophic levels (separate science only) | SB9b energy transfer | 178, 179 |  |
| B3.3.8 calculate the efficiency of biomass transfers between trophic levels and explain how this affects the number of organisms at each trophic level (separate science only) | SB9b energy transfer | 179 |  |
| B3.3.9 recall that many different substances cycle through the abiotic and biotic components of an ecosystem, including carbon and water  | SB9k the carbon cycle SB9l the nitrogen cycle | 198, 199, 200, 201 |  |
| B3.3.10 explain the importance of the carbon cycle and the water cycle to living organisms | SB8j the water cycle SB9k the carbon cycle | 196, 197, 198, 199 |  |
| B3.3.11 explain the role of microorganisms in the cycling of substances through an ecosystem  | SB9k the carbon cycle  | 198, 199 |  |
| B3.3.12 calculate the percentage of mass, in the context of the use and cycling of substances in ecosystems  | SB9b energy transfer | 179 |  |
| B3.3.13 explain the effect of factors such as temperature and water content on rate of decomposition in aerobic and anaerobic environments (separate science only) | SB9m rates of decomposition | 202, 203 | terms aerobic and anaerobic NOT used |
| B3.3.14 calculate rate changes in the decay of biological material (separate science only) | SB9b energy transfer | 179 |  |
| **B3.4 How are populations affected by conditions in an ecosystem?** |
| B3.4.1 explain how some abiotic and biotic factors affect communities, including environmental conditions, toxic chemicals, availability of food and other resources, and the presence of predators and pathogens  | SB9c abiotic factors and communities SB9d biotic factors and communities | 180, 181, 184, 185 |  |
| B3.4.2 describe how to carry out a field investigation into the distribution and abundance of organisms in an ecosystem and explain how to determine their numbers in a given area PAG3 | SB9a ecosystems SB9c core practical quadrats and transects | 177 182 183 | Quadrats, population equation Quadrats and transects only no mention of other sampling/identification techniques |
| B3.4.3 in the context of data related to organisms within a population:a) calculate arithmetic meansb) use fractions and percentagesc) plot and draw appropriate graphs selecting appropriate scales for the axesd) extract and interpret information from charts, graphs and tables  | SB4h GM & agriculture | 91 |   |
| **Chapter B4 Using food and controlling growth** |
| **B4.1 What happens during cellular respiration?** |
| B4.1.1 compare the processes of aerobic and anaerobic respiration, including conditions under which they occur, the inputs and outputs, and comparative yields of ATP  | SB8e cellular respiration | 170 & 171 | plants not mentioned |
| B4.1.2 explain why cellular respiration occurs continuously in all living cells  | SB8e cellular respiration | 170 | ATP not mentioned ("releases energy") |
| B4.1.3 explain how mitochondria in eukaryotic cells (plants and animals) are related to cellular respiration | SB1b plant and animal cells, SB1d inside bacteria | 4 & 5, 10& 11 | Eukaryotic cells 4&5, Bacteria 10 & 11 |
| B4.1.4 describe cellular respiration as an exothermic process | SB8e cellular respiration | 170 |  |
| B4.1.5 a) describe practical investigations into the effect of different substrates on the rate of respiration in yeast PAG5b) carry out rate calculations for chemical reactions in the context of cellular respiration  | SB8e cellular respiration | 170 & 171 | plants not mentioned |
| **B4.2 How do we know about mitochondria and other cell structures?** |
| B4.2.1 explain how electron microscopy has increased our understanding of sub-cellular structures  | SB1b plant and animal cells | 4 & 5 |  |
| B4.2.2 in the context of cells and sub-cellular structures:a) demonstrate an understanding of number, size and scale and the quantitative relationship between unitsb) use estimations and explain when they should be used**c) calculate with numbers written in standard form**  | SB1a microscopes SB1b plant & animal cells SB1d inside bacteria | 2 & 3, 4 & 5, 11 |  |
| **B4.3 How do organisms grow and develop?** |
| B4.3.1 a) describe the role of the cell cycle in growth, including interphase and mitosisb) describe how to use a light microscope to observe stages of mitosis PAG1 *i Learners are not expected to recall intermediate phases* | SB2a mitosis | 30, 31 |  |
| B4.3.2 describe cancer as the result of changes in cells that lead to uncontrolled growth and division | SB2a mitosis | 31 |  |
| B4.3.3 explain the role of meiotic cell division in halving the chromosome number to form gametes, including the stages of interphase and two meiotic divisions *i Learners are not expected to recall intermediate phases* | SB3b meiosis | 53 |  |
| B4.3.4 describe the function of stem cells in embryonic and adult animals and meristems in plants | SB2d stem cells SB4f tissue culture  | 36, 37, 86, 87, | zebra fish |
| B4.3.5 explain the importance of cell differentiation, in which cells become specialised by switching genes off and on to form tissues with particular functions | SB2b growth in animals | 33 |  |
| **B4.4 How is plant growth controlled? (separate science only)** |
| B4.4.1 a) explain how plant hormones are important in the control and coordination of plant growth and development, with reference to the role of auxins in phototropisms and gravitropismsb) describe practical investigations into the role of auxin in phototropism PAG6 | SB6f plant hormones | 136, 137 |  |
| **B4.4.2 describe some of the variety of effects of plant hormones, relating to gibberellins and ethene**  | SB6f plant hormones | 137 |  |
| **B4.4.3 describe some of the different ways in which people use plant hormones to control plant growth**  | SB6g uses of plant hormones | 138, 139 |  |
| **B4.5 should we use stem cells to treat damage and disease?** |
| B4.5.1 discuss potential benefits, risks and ethical issues associated with the use of stem cells in medicine  | SB2d stem cells | 37 |  |
| **Chapter B5 The human body - staying alive** |
| **B5.1 How do substances get into, out of and around our bodies?** |
| B5.1.1 describe some of the substances transported into and out of the human body in terms of the requirements of cells,including oxygen, carbon dioxide, water, dissolved food molecules and urea  | SB8a efficient transport and exchange | 162, 163 |  |
| B5.1.2 explain how the partially-permeable cell membranes of animal cells are related to diffusion, osmosis and active transport | SB1i transporting substances, core practical: osmosis in potato slices | 24, 25 |  |
| B5.1.3 describe the human circulatory system, including its relationships with the gaseous exchange system, the digestive system and the excretory system | SB8c the circulatory system SB8a efficient transport and exchange | 166, 167, 162, 163 | No mention of double circulatory system |
| B5.1.4 explain how the structure of the heart is adapted to its function, including cardiac muscle, chambers and valves  | SB8d the heart SB8c the circulatory system | 168, 169, 166, 167 |  |
| B5.1.5 explain how the structures of arteries, veins and capillaries are adapted to their functions, including differences in the vessel walls and the presence of valves  | SB8d the heart SB8c the circulatory system | 168, 169, 166, 167 |  |
| B5.1.6 explain how red blood cells and plasma are adapted to their functions in the blood  |  SB8c the circulatory system | 166, 167 |  |
| B5.1.7 explain the need for exchange surfaces and a transport system in multicellular organisms in terms of surface area:volume ratio | SB8a efficient transport and exchange SB8b factors affecting diffusion | 162, 163, 164, 165 |  |
| B5.1.8 calculate surface area:volume ratios | SB8a efficient transport & exchange | 162, 163 |  |
| **B5.2 How does the nervous system help us respond to changes?** |
| B5.2.1 explain how the components of the nervous system work together to enable it to function, including sensory receptors, sensory neurons, the CNS, motor neurons and effectors | SB2g the nervous system  | 42, 43 |  |
| B5.2.2 explain how the structures of nerve cells and synapses relate to their functions  *i Learners are not expected to explain nerve impulse transmission in terms of membrane potentials* | SB2g the nervous system SB2i neurotransmission speeds | 42, 43, 46 |  relay and motor neurone |
| B5.2.3 a) explain how the structure of a reflex arc, including the relay neuron, is related to its functionb) describe practical investigations into reflex actions PAG6 | SB2i neurotransmission speeds | 47 |  |
| B5.2.4 describe the structure and function of the brain and roles of the cerebral cortex (intelligence, memory, language and consciousness), cerebellum (conscious movement) and brain stem (regulation of heart and breathing rate)(separate science only) | SB2e the brain | 38, 39 |  |
| **B5.2.5 explain some of the difficulties of investigating brain function(separate science only)** | 0 | 0 | not found (p40 and 41 for investigating brain function, no mention of difficulties) |
| **B5.3 How do hormones control responses in the human body?** |
| B5.3.1 describe the principles of hormonal coordination and control by the human endocrine system  | SB7a hormones | 142, 143 |  |
| **B5.3.2 explain the roles of thyroxine and adrenaline in the body, including thyroxine as an example of a negative feedback system** | SB7b hormonal control of metabolic rate | 144, 145 |  |
| **B5.4 Why do we need to maintain a constant internal environment?** |
| B5.4.1 explain the importance of maintaining a constant internal environment in response to internal and external change | SB7e control of blood glucose SB7g thermoregulation | 151, 154  | definition of homeostasis role of hypothalamus, mention of hypothermia |
| B5.4.2 a) describe the function of the skin in the control of body temperature, including changes to sweating, hair erection and blood flowb) describe practical investigations into temperature control of the body PAG6(separate science only) | SB7g thermoregulation | 155 |  |
| **B5.4.3 explain the response of the body to different temperature challenges, including receptors, processing, responses and negative feedback(separate science only)** | SB7g thermoregulation SB7i the kidneys | 155, 159 | no mention of dehydration, high salt intake, thirst |
| B5.4.4 explain the effect on cells of osmotic changes in body fluids *i Learners are not expected to discuss water potential (separate science only)* | SB7h osmoregulation | 156 | water potentials, lysis and shrinking not specifically mentioned |
| B5.4.5 describe the function of the kidneys in maintaining the water balance of the body, including filtering water and urea from the blood into kidney tubules then reabsorbing as much water as required (separate science only) | SB7h osmoregulation | 156 | "urinary system removes excess amounts.." not mentioned that kidneys vary amount/concentration of urine (water) |
| **B5.4.6 describe the effect of ADH on the permeability of the kidney tubules(separate science only)** | SB7i the kidneys | 159 | controlling water content |
| **B5.4.7 explain the response of the body to different osmotic challenges, including receptors, processing, response, and negative feedback (separate science only)** | SB7g thermoregulation SB7i the kidneys | 155, 159 | no mention of dehydration, high salt intake, thirst |
| B5.4.8 in the context of maintaining a constant internal environment:a) extract and interpret data from graphs, charts and tablesb) translate information between numerical and graphical forms  | SB7f type 2 diabetes | 152, 153 |  |
| **B5.5 What role do hormones play in human reproduction?** |
| B5.5.1 describe the role of hormones in human reproduction, including the control of the menstrual cycle  | SB7c the menstrual cycle SB7d hormones & the menstrual cycle | 146, 147, 148, 149 |  |
| **B5.5.2 explain the interactions of FSH, LH, oestrogen and progesterone in the control of the menstrual cycle**  |  SB7d hormones & the menstrual cycle | 148 |  |
| B5.5.3 explain the use of hormones in contraception and evaluate hormonal and non-hormonal methods of contraception  | SB7c the menstrual cycle  | 147 | comparison table. No evaluation of different methods |
| **B5.5.4 explain the use of hormones in modern reproductive technologies to treat infertility**  |  SB7d hormones & the menstrual cycle | 149 |  |
| **B5.6 What can happen when organs and control systems stop working?** |
| B5.6.1 explain how insulin controls the blood sugar level in the body  | SB7e control of blood glucose  | 150 |  |
| **B5.6.2 explain how glucagon and insulin work together to control the blood sugar level in the body**  | SB7e control of blood glucose  | 151 |  |
| B5.6.3 compare type 1 and type 2 diabetes and explain how they can be treated  | SB7e control of blood glucose SB7f type 2 diabetes | 151, 152 |  |
| B5.6.4 a) explain how the main structures of the eye are related to their functions, including the cornea, iris, lens, ciliary muscle and retina and to include the use of ray diagramsb) describe practical investigations into the response of the pupil in different light conditions PAG6 (separate science only) | SB2h the eye | 44, 45 |  |
| B5.6.5 describe common defects of the eye, including short- sightedness, long-sightedness and cataracts, and explainhow these problems may be overcome, including using ray diagrams to illustrate the effect of lenses (separate science only) | SB2h the eye | 45 |  |
| **B5.6.6 explain some of the limitations in treating damage and disease in the brain and other parts of the nervous system(separate science only)** | 0 | 0 | not found (as above) |
| **Chapter B6 Life on Earth - past, present and future** |
| **B6.1 How was the theory of evolution developed?** |
| B6.1.1 state that there is usually extensive genetic variation within a population of a species  | SB3g alleles SB4b Darwin’s theory | 64, 78 | although never explicitly stated |
| B6.1.2 recall that genetic variants arise from mutations, and that most have no effect on the phenotype, some influence phenotype and a very few determine phenotype | SB3e genetic variants and phenotypes SB3j gene mutation | 60, 61, 70 | eye colour, weight and height not given as examples |
| B6.1.3 explain how evolution occurs through natural selection of variants that give rise to phenotypes better suited to their environment | SB4b Darwin’s theory | 78, 79 | natural selection due to genetic variation (not mutation) |
| B6.1.4 explain the importance of competition in a community, with regard to natural selection | SB4b Darwin’s theory  | 78 | bullet point ref. competition |
| B6.1.5 describe evolution as a change in the inherited characteristics of a population over a number of generations through a process of natural selection which may result in the formation of new species | SB4b Darwin’s theory | 78, 79 |  |
| B6.1.6 explain the impact of the selective breeding of food plants and domesticated animals  | SB4g genes in agriculture and medicine | 88 |  |
| B6.1.7 describe how fossils provide evidence for evolution  | SB4a evidence for human evolution SB4b Darwin’s theory | 76, 77, 79 | fossil evidence antibiotic resistance |
| B6.1.8 describe the work of Darwin and Wallace in the development of the theory of evolution by natural selection(separate science only) | SB4c development of Darwin’s theory | 80, 81 |  |
| B6.1.9 describe modern examples of evidence for evolution including antibiotic resistance in bacteria  | SB4a evidence for human evolution SB4b Darwin’s theory | 76, 77, 79 | fossil evidence antibiotic resistance |
| B6.1.10 explain the impact of these ideas on modern biology and society (separate science only) | SB4c development of Darwin’s theory | 80, 81 |  |
| **B6.2 How do sexual and asexual reproduction affect evolution? (separate science only)** |
| B6.2.1 explain some of the advantages and disadvantages of asexual and sexual reproduction in a range of organisms  | SB3a sexual and asexual reproduction | 50, 51 |  |
| **B6.3 How does our understanding of biology help us classify the diversity of organisms on Earth?** |
| B6.3.1 describe the impact of developments in biology onclassification systems, including the use of DNA analysis to classify organisms  | SB4d classification | 82, 83 | artificial and natural classification not mentioned specifically. Impact of developments not actually found |
| **B6.4 How is biodiversity threatened and how can we protect it?** |
| B6.4.1 describe both positive and negative human interactions within ecosystems and explain their impact on biodiversity | SB9g biodiversity and humans SB9h preserving biodiversity | 190, 191, 192, 193 |  |
| **B6.4.2 evaluate evidence for the impact of environmental changes on the distribution of organisms, with referenceto water and atmospheric gases (separate science only)** | SB9e assessing pollution | 186, 187 |  |
| B6.4.3 describe some of the biological factors affecting levels of food security including increasing human population,changing diets in wealthier populations, new pests and pathogens, environmental change, sustainability and cost ofagricultural inputs (separate science only) | SB9i food security | 194, 195 |  |
| B6.4.4 explain some of the benefits and challenges of maintaining local and global biodiversity  | 0 | 0 | not found |
| B6.4.5 extract and interpret information related to biodiversity from charts, graphs and tables  | SB4h GM & agriculture | 91 |  |
| B6.4.6 describe and explain some possible biotechnological and agricultural solutions, including genetic modification, to the demands of the growing human population (separate science only) | SB4h GM and agriculture | 90, 91 | (not related to population growth) |

## Want to switch to OCR?

If you’re an OCR-approved centre, all you need to do is download the specification and start teaching. Your exams officer can complete an intention to teach form which enables us to provide appropriate support. When you’re ready to enter your students, you just need to speak to your exams officer to:

1. Make estimated entries by 10 October so we can prepare the question papers and ensure we’ve got enough examiners.
2. Make final entries by 21 February. If you are not already an OCR-approved centre please refer your exams officer to the centre approval section of our admin guide.

## Next steps

1. Familiarise yourself with the specification, sample assessment materials and teaching resources on the OCR Biology B qualification page of the OCR website.

<http://www.ocr.org.uk/qualifications/gcse-twenty-first-century-science-suite-biology-b-j257-from-2016/>

1. Browse the online delivery guides for teaching ideas and use the Scheme of Work builder to create your personal scheme of work.
<http://www.ocr.org.uk/qualifications/gcse-twenty-first-century-science-suite-biology-b-j257-from-2016/planning-and-teaching/>
2. Get a login for our secure extranet, Interchange – this allows you to access the latest past/practice papers and use our results analysis service, Active Results.

<https://interchange.ocr.org.uk>

1. Sign up to receive subject updates by email.
<http://www.ocr.org.uk/i-want-to/email-updates>
2. Sign up to attend a training event or take part in webinars on specific topics running throughout the year and our Q&A webinar sessions every half term.
<https://www.cpdhub.ocr.org.uk>
3. Attend one of our free teacher network events that are run in each region every term. These are hosted at the end of the school day in a school or college near you, with teachers sharing best practice and subject specialists on hand to lead discussion and answer questions.
<http://ocr.org.uk/qualifications/professional-development/teacher-networks/>